R E P O R T R E S U M E S

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A STATE DEMONSTRATION AND EVALUATION IN DEVELOPING PILOT OVERHEAD TRANSPARENCIES FOR THE SUBJECT AREAS OF SECONDARY SCIENCE, MATHEMATICS, ENGLISH, MODERN FOREIGN LANGUAGES, AND GEOGRAPHY.

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REPORT NUMBER NDEA-VIIB-382 PUB DATE 64
CONTRACT OEC-3-16-040
EDRS PRICE MF-$0.18 HC-$4.60 115P.

DESCRIPTORS- *AUDIOVISUAL AIDS, *TRANSPARENCIES, CURRICULUM ENRICHMENT, *SECONDARY SCHOOLS, SECONDARY EDUCATION, *STATE PROGRAMS, MEDIA SPECIALISTS, DEMONSTRATION PROGRAMS, AUSTIN, TEXAS

A DEMONSTRATION PROGRAM WAS UNDERTAKEN FOR THE PURPOSE OF SHOWING HOW A STATE DEPARTMENT OF EDUCATION CAN UTILIZE ITS RESOURCES AND SUBJECT MATTER SPECIALISTS IN DEVELOPING OVERHEAD TRANSPARENCIES TO IMPLEMENT SECONDARY SCHOOL CURRICULUM IN THE STATE. SUBJECT SPECIALISTS (26) REPRESENTING 10 COURSE FIELDS WERE BROUGHT TOGETHER AT THE BEGINNING OF THE PROGRAM TO DEVELOP PLANS AND PROCEDURES. AREA MEETINGS WERE SCHEDULED SO THAT SEVERAL DESIGNERS COULD MEET TOGETHER TO DEVELOP VISUALS AND CONSTRUCTIVELY CRITICIZE ONE ANOTHER'S WORK. A GROUP OF 59 CLASSROOM TEACHERS WAS SELECTED TO FIELD TEST THE VISUALS. EACH VISUAL WAS TESTED IN AT LEAST FOUR CLASSROOMS. AFTER FIELD TEST FOLLOWUP, A FINAL COPY OF EACH VISUAL WAS PRINTED ON DIAZO FILM FOR THE U.S. OFFICE OF EDUCATION. A COPY OF EACH MASTER WAS PREPARED TO SERVE AS AN ORIGINAL FOR PREPARING PLATES FROM WHICH MULTIPLE MASTERS CAN BE PRINTED ON TRANSLUCENT VELLUM AND DISTRIBUTED TO SCHOOLS. THERE WERE 2,007 MASTERS DEVELOPED. SUBJECT AREAS WERE--(1) MODERN MATHEMATICS, (2) MODERN ALGEBRA, (3) MODERN GEOMETRY, (4) EARTH SCIENCE, (5) MODERN CHEMISTRY, (6) ENGLISH GRAMMAR (GRADE 8), (7) ENGLISH GRAMMAR (GRADE 11), (8) INTRODUCTORY SPANISH, (9) INTERMEDIATE SPANISH, AND (10) WORLD GEOGRAPHY. (JC)

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FINAL REPORT

TEXAS EDUCATION AGENCY AUSTIN, TEXAS

TEXAS TRANSPARENCY DEVELOPMENT PROJECT

A State Demonstration and Evaluation in Developing Pilot Overhead Transparencies for the Subject Area of Secondary Science, Mathematics, English, Modern Foreign Languages, and Geography.

Contract #OE 3-16-040

Title VII B, NDEA

U. S. Department of Health, Education, and Welfare
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TEXAS TRANSPARENCY DEVELOPMENT PROJECT

A STATE DEMONSTRATION AND EVALUATION IN DEVELOPING PILOT OVERHEAD TRANSPARENCIES FOR THE SUBJECT AREAS OF SECONDARY SCIENCE, MATHEMATICS, ENGLISH, MODERN FOREIGN LANGUAGES, AND GEOGRAPHY, FINAL REPORT

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The dissemination activities reported herein were performed pursuant to a contract with the United States Department of Health, Education, and Welfare, Office of Education; Contract OE 3-16-040, National Defense Education Act, Title VII, Part B.

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PREFACE

The Texas Transparency Development Project has been a team approach between Texas public schools, colleges and universities, the Texas Education Agency, and the United States Office of Education. Outstanding public school and college and university personnel selected by the Project Staff have designed and planned each visual master to correlate with the most modern instructional and curriculum approach in the subject area. The consultative staff and art and technical staff of the Texas Education Agency have worked closely with the designers to assure a precise and accurate visual master for classroom use.

Each visual has been classroom tested in several public schools during the 1963-64 and 1964-65 school years. The suggestions and recommendations of the participating classroom teachers have been considered by the designers and editors to assure clarity and accuracy in presentation.

The Texas Transparency Development Project Series includes ten volumes which are as follows:

Volume	I	-	Mathematics 7	Volume	VI	-	World Geography
	II	-	Algebra		VII	-	Spanish I
	III	-	Geometry		VIII	-	Spanish II
	IV	-	Chemistry		IX	-	English 8
	V	-	Earth Science		X	-	English II

The Texas Transparency Development Project has been financed under a contract between the Texas Education Agency and the United States Office of Education, Contract #OE 3-16-040, NDEA Title VII B. Gratitude is expressed to the Project Staff, and to the many subject specialists, artists, technicians,

secretaries, and classroom teachers who have worked so cooperatively and unselfishly to make this project possible.

J. W. Edgar
Commissioner of Education

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THE TEXAS TRANSPARENCY DEVELOPMENT PROJECT

INTRODUCTION

On June 26, 1963, The Texas Education Agency entered into a contract with the United States Office of Education for the purpose of developing a demonstration of how a State Department of Education can utilize its own resources and available subject matter specialists to develop overhead transparencies to implement a curriculum program in a State.

This report is a summary of the techniques employed and results gained in carrying out this demonstration project in the State of Texas. Not only has this project provided a demonstration of a technique of operation, but has provided ten complete sets of visual masters which may be made available to local schools and other agencies.

Background

During the past few years, great strides have been made in revising school course content and in improving the instructional techniques of teaching. Intensive in-service education programs have been provided by local schools and by the Texas Education Agency for the purpose of acquainting teachers with both new subject content and new instructional materials and techniques. New textbooks have been provided to schools to speed the process of introducing new subject content to students.

There still exists, however, a shortage of materials for use with the overhead projector in the various subject areas. A two year

project on the use of teacher teams to demonstrate the use of new instructional media in Texas indicated a strong tendency of Texas teachers to see many opportunities for employing the overhead project for classroom instruction.

It was with these various items in mind (1. new content introduced; 2. new techniques introduced; 3. new textbooks; 4. desires to use the overhead; and 5. a shortage of materials for that purpose) that the Texas Transparency Project was developed.

The Contractor

The Texas Education Agency is the legally constituted body to handle educational matters in the elementary and secondary schools of Texas. It is the equivalent of the State Department of Education or the State Department of Public Instruction in other states.

Within the Texas Education Agency is located a Division of Instructional Media. This division consists of a professional staff of persons knowledgeable in the field of media use, development and production. The division also has an art and technical staff with the skills necessary to develop and produce visual materials. Other instructional divisions of the Texas Education Agency such as Accreditation and Program Development, and Guidance and Supervision, have several professional staff members who are well versed in the curriculum content of the various public school instructional areas.

The project was centered in the Division of Instructional Media with supporting staff being assigned to the project from the Divisions of Guidance and Supervision, and Accreditation and Program Development. Since the production demands of the project were heavier than any previously encountered, the Texas Education Agency, at no cost to the project, enlarged the production area and provided additional work stations and purchased several major pieces of high speed production and lettering equipment.

PROJECT PROCEDURE

Courses

Ten secondary school courses were selected as appropriate areas for the development of new materials. An approximation was made of the number of visual masters needed to cover the subject content of each of these areas. The ten courses and the number of masters allocated to each course is as follows:

(1) Modern Mathematics, Grade 7 (approximately 150 masters)

(2) Modern Algebra, Introductory Course (approximately 150 masters)

(3) Modern Geometry, A Unifed Course, (approximately 400 masters)

(4) Earth Science, Grade 8, (approximately 150 masters)

(5) Modern Chemistry, An Introductory Course, (approximately 200 masters)

(6) English Grammar, Grade 8, (approximately 100 masters)

(7) English Grammar, Grade 11, (approximately 175 masters)

(8) Introductory Spanish, (approximately 100 masters)

(9) Intermediate Spanish, (approximately 150 masters)

(10) World Geography, Grade 9, (approximately 250 masters)

Designers

A group of twenty-six subject matter specialists, representing the ten selected course fields, were chosen from the faculties of public and private non-profit secondary schools, colleges, and universities. These specialists were selected on the basis of their academic qualifications in the appropriate subject matter fields and their exhibited competency in the use and design of visual materials. (See Appendix for list and qualifications of the specialists.)

The specialists were selected by the Project Director and/or Coordinator on the combined recommendation of the subject matter specialists on the Texas Education Agency staff and the recommendation of public school and college personnel in key positions in the state.

The subject specialists were brought together in Austin at the beginning of the project. The twenty-six persons were divided into five groups: (1) English, (2) Spanish, (3) Mathematics, (4) Science, and (5) Geography. Each group spent two days at the Texas Education Agency participating in an orientation involving the overall objectives of the project. The Project Director and Coordinator, working with the Texas Education Agency staff, acquainted the specialists with the changing state curriculum pattern and the goals set for the visual

materials. They were introduced to the technical capabilities of the production department and reviewed technical aspects of visual design and construction.

Plans and procedures were developed with the subject specialists for using a standard design sheet (see sample in Appendix). All visuals are horizontal and utilize color, slides, masks, moving parts, overlays and other techniques to make them versatile. Time tables were adopted and procedures for further group working and planning sessions were developed. Evaluation forms were developed and approved, and criteria for test schools were suggested.

Design and Production Procedures

Through the office of the Project Coordinator, area field meetings were scheduled so that several designers of each course could meet together to plan and develop visuals and to constructively criticize one another's work. When a visual had been designed and a brief editorial comment written for a teacher's guide, the design sheets were submitted to the Project Coordinator who reviewed them and placed them in the hands of the appropriate subject matter specialist on the Texas Education Agency staff. After review by the Texas Education Agency staff, they were returned to the Project Coordinator ready for assignment to an artist. The graphic arts staff interpreted the design and produced a master with the assistance of the technical staff. A diazo paper proof copy of the visual was then pulled for

checking by the Project Coordinator, the Texas Education Agency subject specialist, and the designer. If any changes or revisions were found to be needed, they were made accordingly.

The approved visual master was then placed in the hands of the technical staff. The visual technicians produced five completed copies of each visual for use in the field test schools.

In a number of instances, the entire design team for a course met together to review the visuals before they were made in quintuplicate for distribution to field test schools.

Field Test

A group of 59 classroom teachers was carefully selected to field test the visuals. Each course was tested in at least four Texas classrooms. In order for a teacher to qualify as a field test teacher, a recommendation had to be received from the superintendent or principal of the school, stating:

(1) It is the desire of the school to participate.

(2) The designated teacher will have an overhead projector and screen available in the classroom daily.

(3) The teacher is knowledgeable in the use of the overhead projector.

(4) The teacher is academically trained through recent formal courses and is able to adequately handle the topics introduced by the visuals.

(5) The teacher will faithfully complete all reports and questions associated with the test.

(6) The teacher personally wishes to participate in the project even though there will be no monitary reward.

On the basis of these conditions, the Project Coordinator and Director selected the test teachers from those recommended. An effort was made to have testing done in a variety of schools by both size and geographical distribution. A listing of all test teachers is included in the Appendix.

Field Test Reports

Each field test teacher was supplied with:

(1) A complete set of visuals.

(2) A sheet for each visual containing editorial comment for a teacher's guide with a space for the test teacher to suggest changes (see copy in Appendix).

(3) A critique sheet for each visual to note errors and modifications. The critique was to be returned weekly as visuals were used (see copy in Appendix).

(4) A monthly progress report for each school month indicating the visuals used to date (see copy in Appendix).

(5) A sufficient quantity of student evaluation sheets so that each student enrolled in the course would have an opportunity to respond at the end of the field test (see copy in Appendix)

(6) And finally, a teacher evaluation form to be completed at the close of the field test (see copy in Appendix).

Upon receipt of the various critique and evaluation forms, they were carefully reviewed by the Project Coordinator, the Texas Education Agency subject specialists and the designers. As a result of the critique and comments appearing on these sheets, many revisions were decided upon by the staff. Most revisions were of a technical nature, i.e., color change, typographical error, size of type, order of visuals, or clarification of concept through additional art work. As a result also, some visuals were deleted, others made into two or more and new visuals added.

The editorial material was ammended and supplemented to provide a better teacher guide for the visual material. No tabulation or analysis of any type was made of each of the evaluating instruments other than direct review of each item by the staff. The small number of responses to each question and the specificity of the comments made any further analysis difficult.

In virtually every instance, field test teachers did respond favorably to the series they tested. As previously indicated, they did respond very well to the request to help strengthen the views by pointing out any possible weakness which they or their students could detect. In most instances, changes were made as suggested by the teacher but on occasion it was determined by the designers that the first tester may have lacked an understanding of an occasional point so that their criticisms did not appear valid.

Field Test Follow-up

After the recommended revisions were completed, paper proof copies were again prepared for the study of the staff and designers. After all persons had been satisfied with the content accuracy and the technical quality of each visual, a final copy was printed on diazo film for the United States Office of Education.

A high quality paper copy of each master was prepared to serve as an original for preparing plates from which multiple masters can be printed on translucent vellum. These vellum master copies will hopefully be made available to public schools at a nominal charge so that projectable copies may be made for classroom use. The visuals have been designed so that they may be reproduced by the diazo-ammonia process, the heat process, the diffusion transfer process, or photographically.

VISUALS DEVELOPED

As a result of all activities of the project, a total of 2007 masters were developed. When assembled, these masters make up 761 complete visuals. These are as follows:

(1) Modern Mathematics, Grade 7, (179 masters made into 55 visuals).

(2) Modern Algebra, Introductory Course, (167 masters made into 102 visuals).

(3) Modern Geometry, A Unified Course, (402 masters made into 137 visuals).

(4) Earth Science, Grade 8, (210 masters made into 75 visuals).

(5) Modern Chemistry, An Intorductory Course, (258 masters made into 69 visuals).

(6) English Grammar, Grade 8, (123 masters made into 66 visuals).

(7) English Grammar, Grade 11, (178 masters made into 75 visuals).

(8) Introductory Spanish, (136 masters made into 35 visuals).

(9) Intermediate Spanish, (68 masters made into 29 visuals).

(10) World Geography, Grade 9, (280 masters made into 118 visuals).

CONCLUSIONS

The project staff has concluded that it is possible and feasible for a State Department of Education to utilize its staff and available local public school and college subject matter specialists to design and develop instructional materials such as transparencies for the overhead projector.

The subject specialists selected from public school and college and university faculties have all responded in an excellent manner. In every case, the specialists performed at a very high level and developed materials which appear to be of excellent quality. The small honorarium paid each specialist is below that which they would have expected had they been developing the materials for a commercial source.

The professional subject matter staff of the Texas Education Agency has participated wholeheartedly in the project. In fact, they have found many uses for the materials being developed and have used the work of the project as the nucleus of other activities.

The production section of the Division of Instructional Media is well equiped with high speed diazo reproduction equipment, photographic equipment, automatic photocomposing lettering equipment, artists work stations

and other equipment necessary for the production of high quality original masters and diazo copies of transparencies. The production department is well staffed by trained graphic artists and technicians. All these factors appear important for the economical production of quality visual masters.

School administrators and teachers in Texas schools were eager to field test the visuals, although no compensation or remuneration was provided in any way to the teacher or to the school system. Teachers cooperated wholeheartedly and provided much valuable criticism of the visuals. It is the feeling of the project staff that probably two to three field test situations of each course would have been as satisfactory as the five carried out in most cases.

Perhaps the most difficult elements in the project were the standardization of technical language and symbols and the development of editorial materials for a teacher's guide. In the first instance, difficulty was encountered in being consistent in notation, especially in the mathematics areas. With eight designers in the subject area and with a variety of notation being used in the several new approaches to modern mathematics, the problem was complex. It is the recommendation of the project staff to others working in the area, that such problems be identified and solved before actual production of visuals starts.

The other problem of editorial material for the visuals was also confusing. Some designers provided a one sentence explanation of each visual while others prepared up to four pages. Some pre-determined editorial policy on length of comment would have helped considerably. Even

as the project is completed, the staff is not completely satisfied with the accompanying teacher's guide.

An activity such as this project calls for close cooperation between the coordinator, the designers, the staff subject specialists, and the artists. Further close opperation is required between the artists and the technicians. In a project involving a relatively large number of professional and clerical personnel, separated by distances up to and exceeding 500 miles, requires skillful coordination and clear communication.

Brief descriptions of the project have appeared in several journals and newsletters and the visuals have been shown and discussed at several meetings, both in Texas and nationally. These exposures have attracted a great amount of attention and several hundred letters have been received seeking information about the availability of materials. In fact, several purchase orders have been received and of course, subsequently returned.

The enthusiasm and cooperation of the designers and staff and the warm reception from school personnel have reinforced the feeling of the project staff that such a project is a worthwhile endeavor.

APPENDIX

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PLAN OF OPERATION DATED MAY 27, 1963, FOR "A STATE DEMONSTRATION AND EVALUATION IN DEVELOPING PILOT OVERHEAD TRANSPARENCIES FOR THE SUBJECT AREAS OF SECONDARY SCIENCE, MATHEMATICS, ENGLISH, MODERN FOREIGN LANGUAGES, AND GEOGRAPHY"

Section 731 of Part B of Title VII of Public Law 85-864 directs the Office of Education "to disseminate information concerning new educational media to State or local educational agencies for use in their public elementary or secondary schools, and to institutions of higher education." The Commissioner of Education recognizes this responsibility and wishes to provide advice, counsel, technical assistance, and demonstrations to State or local educational agencies and institutions of higher education undertaking to utilize such media of communication to increase the quality or depth or broaden the scope of their educational programs, as authorized in Section 731 (3) Public Law 85-864.

To this end, the Office of Education wishes to have conducted a State demonstration and evaluation in developing pilot overhead transparencies for the subject areas of secondary science, mathematics, English, modern foreign languages, and geography.

Pursuant to Section 731 (5) of Public Law 85-864, the Office of Education believes that such a demonstration should be conducted under the auspices of a State Department of education, and proposes that a contract be awarded to an appropriate agency to conduct such a demonstration.

The Texas Education Agency has evidenced its interest and qualifications for performing this service, and has submitted a plan of operation dated May 27, 1963. This plan is essentially as follows:

Background

Concern with methods of strengthening the American school curriculum has resulted within recent years in the development by subject matter specialists and educators of such materials as the SMSG mathematics, BSSC biology, CHEM Study chemistry, and PSSC physics on the national level. The Texas Curriculum Studies Commissions have incorporated many of the concepts of these programs into the Texas curriculum. Extensive modifications and changes have been made in course content and instructional techniques in many areas with greatest emphasis on the junior high school.

Effective utilization of all these purposeful programs in Texas schools is necessarily predicated on teachers' training in and understanding of them and their subsequent access to the necessary visual materials. Intensive in-service education provided by the local districts and the State department of education has furnished opportunities for teachers to gain knowledge and understanding of these programs.

At the present time however, there exists a shortage of materials ready for conversion into transparencies for overhead projection, especially in the areas of secondary mathematics, secondary science, secondary English language arts, secondary modern foreign languages, and geography which are suitable for use with not only the Texas curriculum program, but with many of the nationally developed curriculum programs.

Purpose

The purpose of this project is to demonstrate how a State department of education can utilize its own resources and available subject matter specialists to develop overhead transparencies to implement a curriculum program in that State. The project will result not only in a demonstration of a technique of operation, but will provide ten complete series of appropriate visual masters which will be made available at cost to the local schools of the State and to other State departments of education (after approval by the U. S. Office of Education) for their use in seeking improvement in instruction through classroom use of these materials.

Procedure

Ten series of transparencies for the overhead projector will be developed in the subject matter fields of secondary mathematics, science, English, Spanish, and geography. The following steps will be followed:

1. A group of approximately 25 subject matter specialists will be selected from the faculties of public and private secondary schools, colleges and universities. These specialists will be selected on the basis of their qualifications in the appropriate subject matter fields and their exhibited competency in the use and/or design of visual materials. They will work in small groups and as individuals to select, design, and develop visuals for conversion into overhead projection transparencies. The work of these specialists will be coordinated by a full-time consultant under the direction of the Division of Instructional Media, Texas Education Agency.

2. The subject matter specialists will be brought together at the beginning of the project period to receive orientation on the over-all objectives of

the project; to review the technical aspects of visual design and construction; to develop a time table and work schedule; and to determine specific subject matter to be visualized. Specialists will be assembled in both small groups and large groups at such other times as determined by the project director. The need for additional meetings will be necessary to assure consistency of plans and work and to provide maximum opportunity for exchange of ideas between members of subject matter groups.

3. The subject matter specialists, in cooperation with the instructional media consultant, will develop a procedure for evaluating the visuals developed under this project. Teacher and student reactions will be obtained on the effectiveness of visualizing the subject content through overhead transparencies, on accuracy of content portrayed, on effectiveness of the techniques and visual details inherent in the transparencies.

4. The graphic arts staff of the Division of Instructional Media, working under the supervision of the project director, will convert plans and designs of the subject matter specialists into visual masters. These masters will be proofed for design and accuracy of content by the subject matter and media specialists.

5. The technical staff of the Division of Instructional Media, will produce sets of transparencies from the approved masters. These will be used for field testing the details of the visuals for revision prior to developing the final set of masters.

6. A group of approximately 50 classroom teachers in appropriate grade level and subject areas will be selected to test all transparencies through utilization in actual classroom instruction. The teachers will subsequently report both student and teacher reactions to subject content, visual design, and method of presentation through reporting methods previously designed by the project staff.

7. The subject matter specialists, in cooperation with the project director, will analyze the results of the reports and make such modifications and revisions in the visual masters as necessary. The art and technical staff will then produce modified transparencies, which will be returned to the evaluating teachers and students for their further reactions.

8. When the foregoing procedure has been completed, and the final form achieved for the master set, the transparencies will be submitted to the U. S. Office of Education for approval before the final masters are produced. Two sets of approximately 2,000 visual masters and transparencies will be deposited with the Office of Education in appropriate containers.

At the discretion of the U. S. Office of Education, visual masters may be provided to other State departments of education by the Texas Education Agency at a cost equivalent to production costs plus handling and mailing.

9. The Contractor will supply to the U. S. Office of Education a final report of procedures and data upon which details of the final sets of transparencies were determined. If the Office of Education determines that the report will be useful for wider distribution, costs and details of publishing the report will be determined.

Products

The end product will be a set of some 2,000 visual masters from which transparencies or other masters may be made. Masters will be produced on translucent vellum paper and/or intermediate diazochrome film. The visuals will utilize color, static and overlay sheets, slide masks, and other special effects as may be needed. A second product will be a report documenting procedures and effects of the project suitable for use by Texas and other States.

The subjects to be visualized are as follows:

1. Mathematics (three series)

   a. Seventh grade arithmetic (modern approach): approximately 150 masters;
   b. Ninth grade algebra (modern approach): approximately 150 masters;
   c. High school geometry (solid and plane as a unified course): approximately 400 masters.

2. Science (two series)

   a. Eighth grade earth sciences: approximately 150 masters;
   b. High school chemistry (modern approach): approximately 200 masters.

3. English (two series)

   a. Eighth grade English grammar: approximately 100 masters;
   b. Eleventh grade English grammar: approximately 175 masters.

4. Spanish (two series)

   a. Ninth grade introductory Spanixh: approximately 100 masters;
   b. Tenth grade intermediate Spanish: approximately 150 masters.

5. Geography (one series)

a. Ninth grade world geography: approximately 250 masters.

These 2,000 masters will be utilized to produce six sets of each series for test purposes and three sets of each series in final form (two for the U. S. Office of Education and one for the Texas Education Agency files).

Time Schedule

June 1963	-Selection and orientation of subject matter specialists.
October 1962	-First visuals provided to schools to start tests through actual classroom use.
June 1963	-Staff review of test results from local schools.
November 1964	-Completion of visuals with modifications as indicated, plus final masters and transparencies and report to the U. S. Office of Education.

Personnel

The project will be administered by the Division of Instructional Media, with the director, assistant director, and two consultants maintained by State funds, and one consultant provided under contract funds. It will be the responsibility of the latter consultant to coordinate all project activities under direction of the Division Director and the Assistant Commissioner for Instruction. One additional secretary will be added to the staff for project correspondence, typing, and filing. Four artists and two technicians will design and handle all technical aspects of the production of the visual masters, the test transparencies, and the approved final product transparencies.

All state-level consultants in science, mathematics, modern foreign language, English, and geography will work closely with the Division of Instructional Media and the subject matter specialists in developing materials suitable for use in Texas and other States.

The Texas Education Agency has submitted the following budget estimate in the amount of $82,868 for expenses necessary to completion of the work described above. The Office of Education accepts this estimate as fair and reasonable and authorizes the Texas Education Agency to proceed forthwith with the demonstration. The Texas Education Agency certifies by acceptance of this contract that all salaries, wages, honoraria, and related expenses are consistent with their policy concerning such expenditures.

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ALGEBRA

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MATHEMATICS 7

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Ph. D., Texas A & M University, College Station, Texas

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Education:

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M. A., Indiana University, Bloomington, Indiana
Ph. D., University of Michigan, Ann Arbor, Michigan

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Lamar State College of Technology
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Ph. D., State University of Iowa, Iowa City, Iowa

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Chemistry Teacher
Memorial Senior High School
Spring Branch Independent School District
Houston, Texas

Education:

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M. S., University of Wisconsin, Madison, Wisconsin

Paul Westmeyer

Associate Professor of Science Education
The University of Texas
Austin, Texas

Education:

B. S., Ball State Teachers College, Muncie, Indiana
M. A., Ball State Teachers College, Muncie, Indiana
Ed. D., University of Illinois, Urbana, Illinois

WORLD GEOGRAPHY

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Chairman of the Department of Geography
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Education:

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M. S., University of Tennessee, Knoxville, Tennessee
Ph. D., George Peabody College, Nashville, Tennessee

Robert K. Holz

Assistant Professor of Geography
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Education:

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M. A., Southern Illinois University, Carbondale, Illinois
Ph. D., Michigan State University, East Lansing, Michigan

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M. A., George Peabody College, Nashville, Tennessee

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Helen M. Bownds (Continued)

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TEXAS EDUCATION AGENCY STAFF SUBJECT MATTER SPECIALISTS ASSISTING IN THE DEVELOPMENT OF THE TRANSPARENCIES

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Chief Consultant in English
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Virginia Cutter
Consultant in English
Division of Program Development

SPANISH

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Division of Guidance and Supervision

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Division of Program Development

Work Sheet For T.E.A. Transparency Project

Designer's Name: _____ Course: _____ Grade: _____ Visual Number: _____ Total Static Sheets: _____

Total Overlays: _____ This sheet is: Static _____ Overlay _____ On overlays designate hinge position: Top____ Bottom____ Left____ Right_____

Color preference for this sheet _____ Special mounting instructions _____

Explanation of visual (Write on static sheet)

Brief explanation for classroom teachers

For office use only:

Proofed by _____

Art work by _____

Proofed by _____

Processed by _____

Date received _____

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TEACHERS AND SCHOOLS COOPERATING IN THE CLASSROOM TESTING OF PROJECT TRANSPARENCIES

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E. B. Pierson, Lufkin Public Schools, Lufkin, Texas
Margaret Lamar, Queens Intermediate School, Pasadena, Texas
Edward Baca, Bay City Public Schools, Bay City, Texas
Clarence Carter, Pasadena Public Schools, Pasadena, Texas
Oralena Ferrel, Pershing Junior High School, Houston, Texas
Irma Jean Wornell, Pershing Junior High School, Houston, Texas
Lou Orr, Columbia-Brazoria Public Schools, West Columbia, Texas

ALGEBRA

Josephine Bader, Pershing Junior High School, Houston, Texas
Marianna May, Edinburg Public Schools, Edinburg, Texas
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John B. Robinson, Bay City Public Schools, Bay City, Texas
Dorothy Williams, South Houston High School, Pasadena, Texas
Marjorie Martin, Angleton Public Schools, Angleton, Texas
Walter Fields, Pasadena Public Schools, Pasadena, Texas
Nona Hartman, Pershing Junior High School, Houston, Texas

GEOMETRY

James E. Pollard, Post Public Schools, Post, Texas
Mary Elizabeth Hurst, Bay City Public Schools, Bay City, Texas
Ruth Shroyer, Flour Bluff High School, Corpus Christi, Texas
Rubye Rodeck, Westbury High School, Houston, Texas
Cherry Baucum, Pasadena Public Schools, Pasadena, Texas
Zagona Cox, South Houston High School, Pasadena, Texas

CHEMISTRY

Katherine Mays, Needville Public Schools, Needville, Texas
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Kenneth J. Voytek, Robert E. Lee High School, Baytown, Texas
Frank Brandon, John Foster Dulles High School, Stafford, Texas

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Mae Lee, Corpus Christi Public Schools, Corpus Christi, Texas
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Stanley Keathley, Bay City Public Schools, Bay City, Texas
Nettie Shaw, Carthage Public Schools, Carthage, Texas

WORLD GEOGRAPHY

William Steinman, El Paso High School, El Paso, Texas
Francis Loomis, Burges High School, El Paso, Texas
Luis Cortes, Jefferson High School, El Paso, Texas
George Rubenstein, Irvin High School, El Paso, Texas
Bob Wyche, Robert E. Lee High School, Tyler, Texas
Mattie Alice Baker, John Tyler High School, Tyler, Texas
James McClendon, Scott High School, Tyler, Texas
Harold P. Alderman, Texas City Public Schools, Texas City, Texas
Doris McBride, Texas City Public Schools, Texas City, Texas
David Median, Texas City Public Schools, Texas City, Texas
Meriworth Mabry, Texas City Public Schools, Texas City, Texas
Mary Fletcher, Brownwood Public Schools, Brownwood, Texas
William White, Brownwood Public Schools, Brownwood, Texas
John Shirley, Brownwood Public Schools, Brownwood, Texas

ENGLISH 8

Shirley Neal, McAllen Public Schools, McAllen, Texas
Melba Gail Sherwood, Lubbock Public Schools, Lubbock, Texas
Shirley Franklin, Moore Junior High School, Tyler, Texas

ENGLISH 11

John Gordon, McAllen Public Schools, McAllen, Texas
Ella Norene Ryder, Lubbock Public Schools, Lubbock, Texas
Vernie Whiddon, Ector County Public Schools, Odessa, Texas
Floy B. Hinson, Ector County Public Schools, Odessa, Texas
Jo Ann McMullen, John Tyler High School, Tyler, Texas
Lovene Goins, Angleton Public Schools, Angleton, Texas

SPANISH I

Eliza del Valle, El Paso Public Schools, El Paso, Texas
Fermin Rodriguez, El Paso Public Schools, El Paso, Texas
Alonso M. Perales, Our Lady of the Lake College,
San Antonio, Texas

SPANISH II

Eliza del Valle, El Paso Public Schools, El Paso, Texas
Fermin Rodriguez, El Paso Public Schools, El Paso, Texas
Alonso M. Perales, Our Lady of the Lake College,
San Antonio, Texas

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TRANSPARENCY MASTER PROJECT

SUBJECT _____ VISUAL NO. _____

DESIGNED BY _____ NO. OF MASTERS _____

ART BY _____

PRODUCED BY _____

U. S. O. E. CONTRACT OE 3-16-040

EDITORIAL COMMENT:

TEACHER COMMENT:

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Course _____
Visual Number _____

Critique

(Write a brief statement explaining your criticism and telling how you would alter the visual to remove the objection.)

1. Composition or lay-out is poor. (over-crowded, unbalanced, etc.)

_____

_____

_____

2. Colors are not used advantageously. (too light, too many, poor choices, etc.)

_____

_____

_____

_____

3. Lettering is illegible. (fuzzy, crowded, too small, etc.)

_____

_____

_____

4. The sketch is inadequate. (does not tell the story, misrepresents idea, etc.)

_____

_____

_____

5. The content contains errors. (Please list.)

_____

_____

_____

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Course _____

Monthly Progress Report

(Note: If you have not submitted a critique on a visual, it is assumed that you have approved it in its original format.)

During _____ I used the following visuals: (list numbers)
(month)

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Student Evaluation

1. Are the visuals attractive?

2. Does the content have freshness of appeal (i.e., does it present new ideas or ideas in a new way?)

3. Do the visuals stimulate interest in the course?

4. Do the visuals make it easier/more difficult to learn?

5. What improvements would you suggest in design or content?

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EVALUATION FORM

Course _____

Transparency _____ through _____

I. Design	Yes*	No*
1. Do the designs arouse attention?	____	____
2. Are the lay-outs or compositions good (not over-crowded)?	____	____
3. Do any features of the visuals distract attention?	____	____
4. Is lettering legible and large enough?	____	____
5. Are colors used advantageously?	____	____
6. Is the series unified in design or format?	____	____

II. Content		
1. Does the content have freshness of appeal (i.e., does it present new ideas or ideas in a new way)?	____	____
2. Is the content accurate?	____	____
3. Do students comprehend the contents of the visuals?	____	____
4. Do the visuals present material which could not easily be presented otherwise, or which could not otherwise be as effectively presented?	____	____
5. Is there adequate focus in the content presented?	____	____
6. Is the content for the series well organized with logical sequence and proper emphasis?	____	____
7. Are there significant gaps in the sequence?	____	____

* On each appropriate item, write a brief statement telling how you would alter the transparency to remove the objection.

III. Editorial content	Yes	No
1. Are purposes for each visual clearly defined in editorial content?	_____	_____
2. Is editorial content adequate?	_____	_____

IV. Method of Presentation

1. Has your primary method of use been for presentation of new material, review of material, or testing? _____
   _____
   _____

2. If you have used the transparencies for both presentation of new material and for review, how effective was its use the second time? _____
   _____
   _____

V. Changes

1. What changes, if any, have you made in your work as a result of (or in conjunction with) these materials? Explain:

   a. Organized classwork differently._____
      _____

   b. Spent more or less time in preparation for classwork.
      _____
      _____

   c. Spent more or less time in presenting content._____
      _____
      _____

   d. Added new and/or dropped old content._____
      _____
      _____

   e. Used more or fewer references._____
      _____

   f. Covered material more or less thoroughly._____
      _____
      _____

2. Do tests indicate improvement in students' grades?_____
   _____
   _____

3. Has student interest in content been aroused more through this presentation than through presentation by traditional media?

_____

_____

VI. General

1. Name the textbook which you used in this course._____

_____

2. Name supplementary books or materials which you found helpful in presenting these visuals._____

_____

3. On what topics do you think additional transparencies would be helpful?_____

_____

4. Give an over-all evaluation of these materials: not usable____ of little value____ poor____ fair____ good____ excellent____

5. Use the remainder of the sheet to write any comments which you feel might be helpful (student reactions, suggestions for revisions, usefulness of medium).

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SAMPLE MASTERS

The following ten pages are samples of masters from each of the ten courses.

The following facts should be noted regarding the masters selected for inclusion in this final report.

a. Each master is pictured at 96% of actual size.

b. The masters are printed on regular bond paper rather than the translucent vellum on which they are prepared for distribution.

c. Although many of the visuals are composed of multiple masters and utilize overlays and other special techniques, the masters chosen for inclusion in this report are all single static sheets.

Texas Transparency Development Project U. S. O. E. Contract OE 3-16-040

Visual No. 20 Static Color Red

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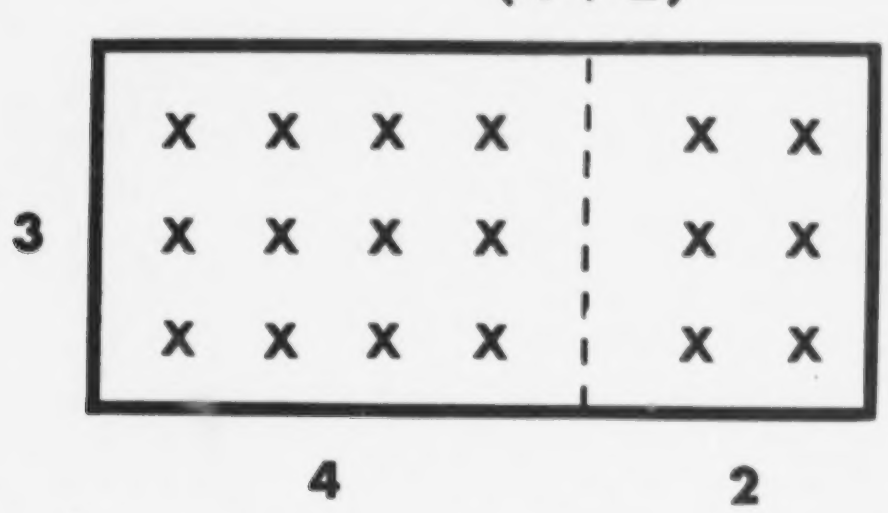
DISTRIBUTIVE PROPERTY

For each element a, b, and c,

$$a(b+c) = ab + ac$$

EXAMPLE:



$$3(4+2) = 3 \cdot 4 + 3 \cdot 2$$

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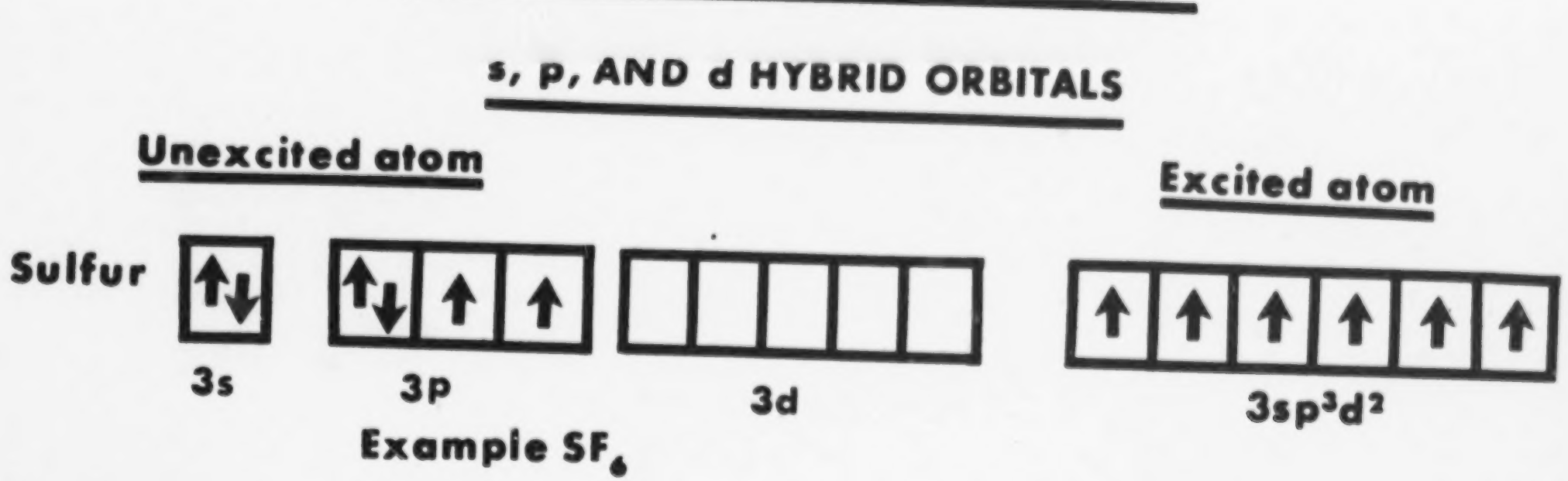
EXCITATION OF VALENCE ELECTRONS

s, p, AND d HYBRID ORBITALS



Visual No. 38 Static Color Violet
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CHEMISTRY
53
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WORLD GEOGRAPHY Visual No. IV, 4 Static Color Blue Tint

WAYS OF LOOKING AT THE WORLD

NORTHERN HEMISPHERE

EASTERN HEMISPHERE

LAND HEMISPHERE

SOUTHERN HEMISPHERE

WESTERN HEMISPHERE

WATER HEMISPHERE

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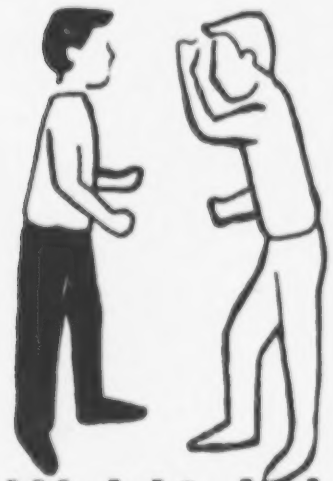
GRAMMAR
IS THE ORGANIZATION OF LANGUAGE

John hit Bill.



Bill hit John.

The boy laughs.

The boys laugh.

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ENGLISH 8

Visual No. *I, 9* Static Color Yellow Tint

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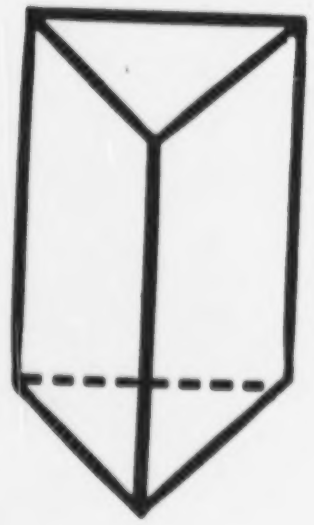
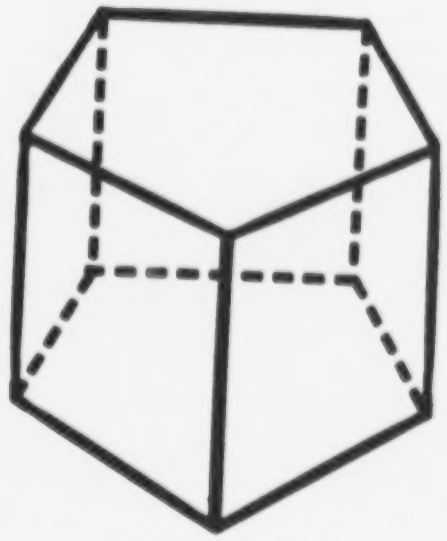
TYPES OF PRISMS

Right:

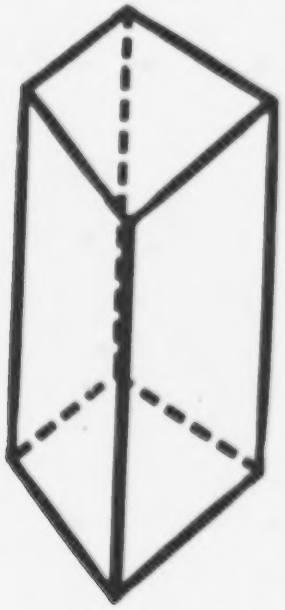
Triangular



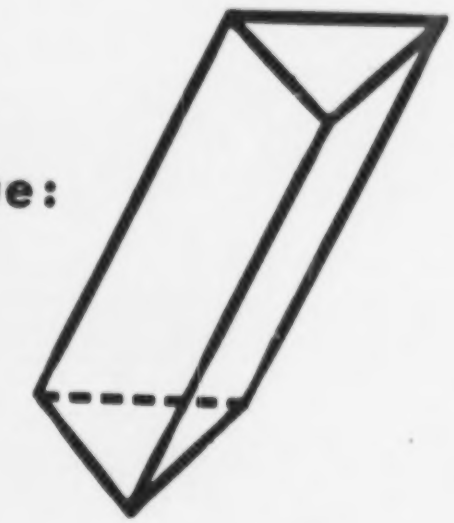
Regular

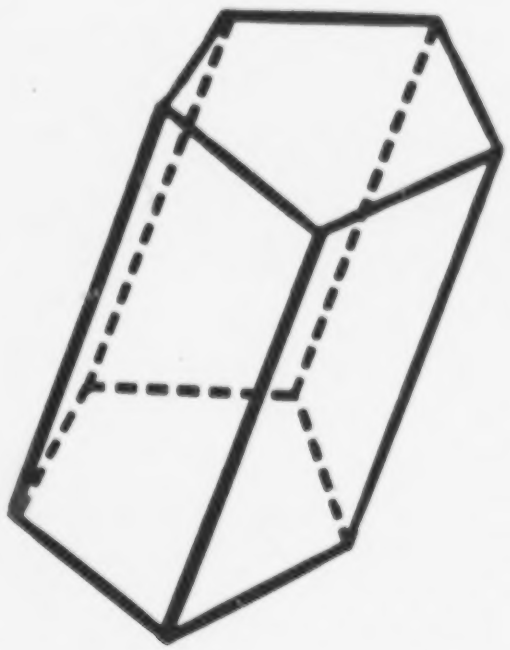


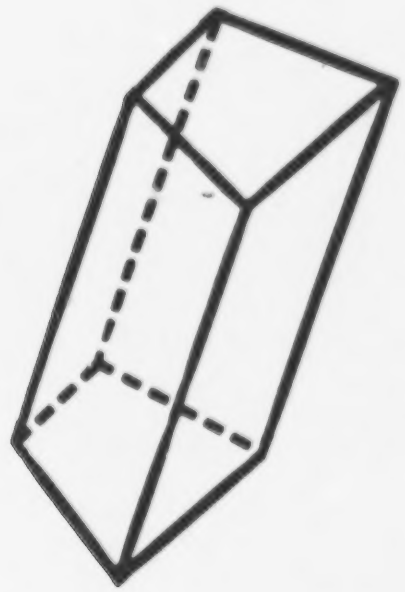
Quadrangular



Oblique:







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Visual No. VI,16 Static Color Black

GEOMETRY
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Texas Transparency Development Project U. S. O. E. Contract OE 3-16-040

Visual No. II,14 Static Color Yellow Tint

AUNQUE LLUEVA, VAMOS AL CAMPO.

61

AUNQUE LLUEVE, VAMOS AL CAMPO.

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SPANISH II

Texas Transparency Development Project U. S. O. E. Contract OE 3-16-040

Visual No. I, 22 Static Color Green Tint

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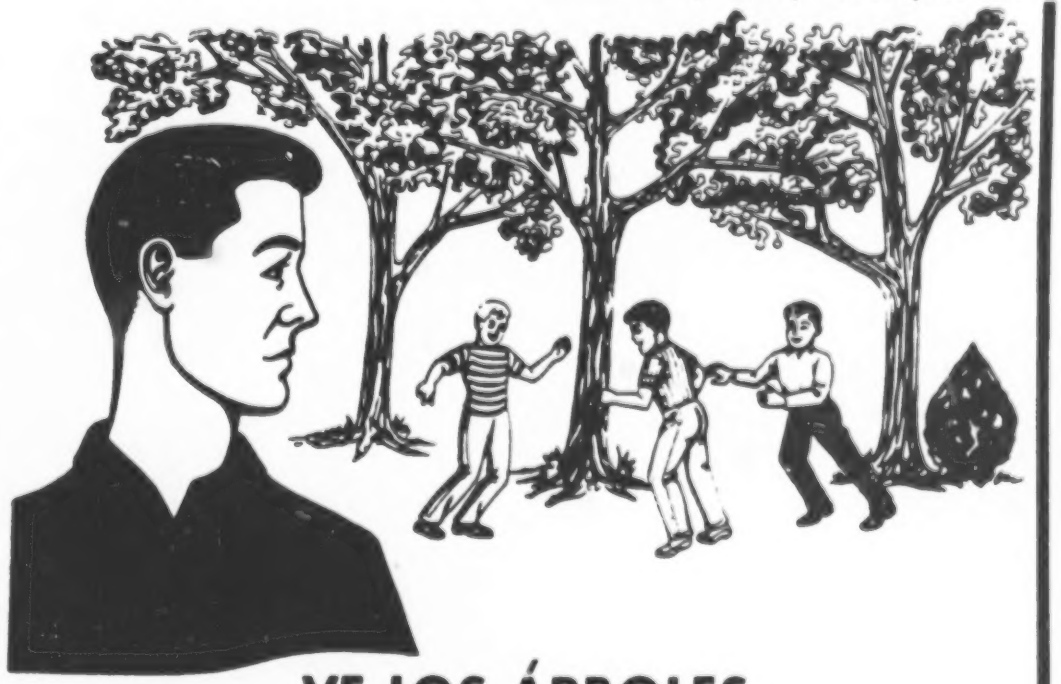
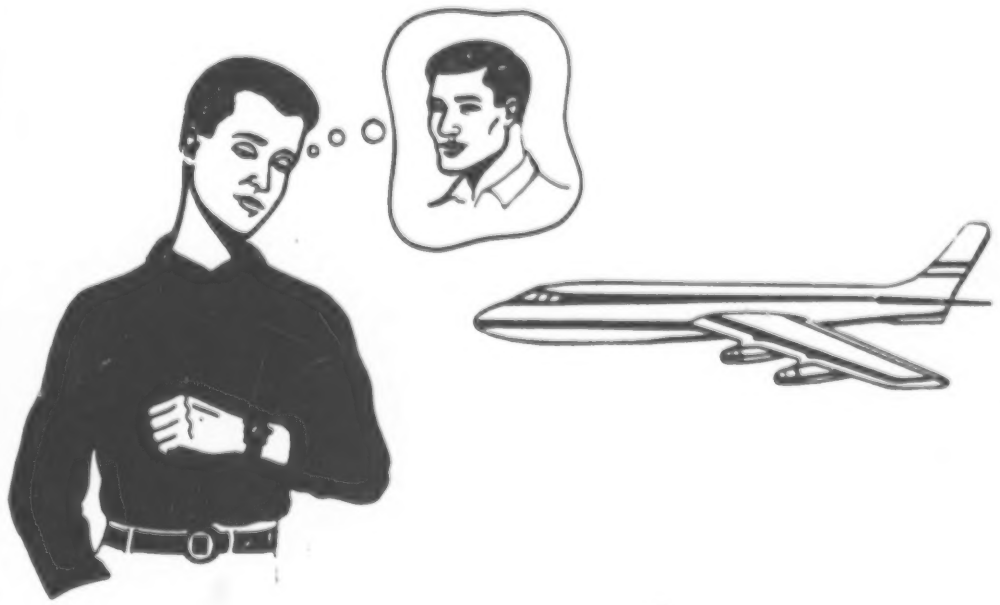


VE LOS ÁRBOLES.
VE A LOS NIÑOS JUGANDO.



ESPERA EL AVIÓN.
ESPERA A SU AMIGO JUAN.

BUSCA SU PLUMA.
BUSCA A SU HERMANA.

PREFIERE LAS REVISTAS DE DEPORTES.
PREFIERE A LAS SEÑORITAS BONITAS.

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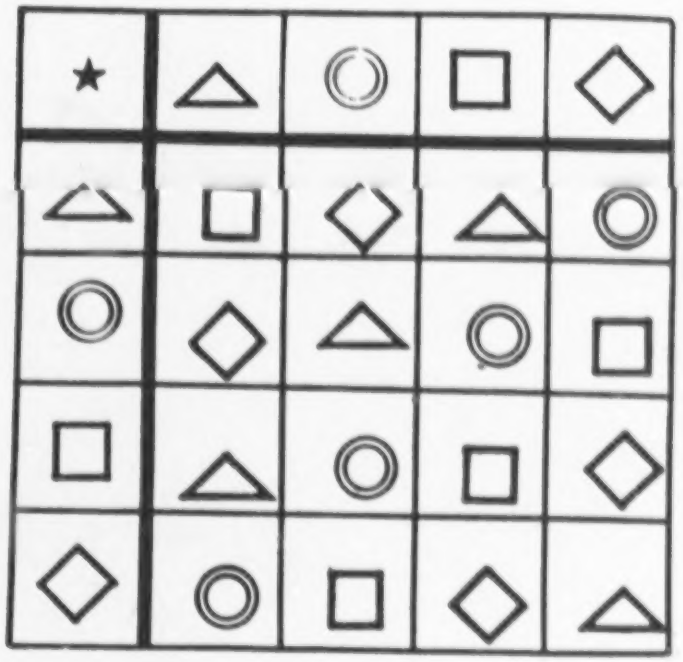
ANOTHER MATHEMATICAL SYSTEM



⊛	A	B	C	D
A	D	A	C	B
B	A	C	B	D
C	C	B	D	A
D	B	D	A	C

Closed?

Commutative?

Associative?

Identity?

Inverses?

Closed?

Commutative?

Associative?

Identity?

Inverses?

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AND THEY ALL MEAN "THREE"

TRE (ALB.) TRÊIS (GRK.) THREE (ENG.) TRE (ITAL.) TRĪ (IRISH)

TRE (TOCH. A.) TRĒS (LAT.) TRI (HITT.) TRI (WELSH) TREI (RUM.)

TROIS (FR.) THRĪR (OLD NORSE) TRES (SP.) TRĪS (LET.) THRĪ (O. E.)

THREIS (GOTH.) TRE (SWED.) TRÍ (CZECH.) TRI (RUSS.) TRI (NORW.)

TRE (DAN.) TRYS (LITH.) TRAYAS (SKT.) THRE (MID. ENG.) ΘRĀYŌ (AVEST.)

DREI (GER.) TRZY (POL.) DRIE (DU.) TRIJE (CH. SLAVIC) THRI (ZEND)

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ENGLISH 11 Visual No. IV, 1 Static Color Magenta

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EARTH SCIENCE Visual No. III,10 Static Color Black

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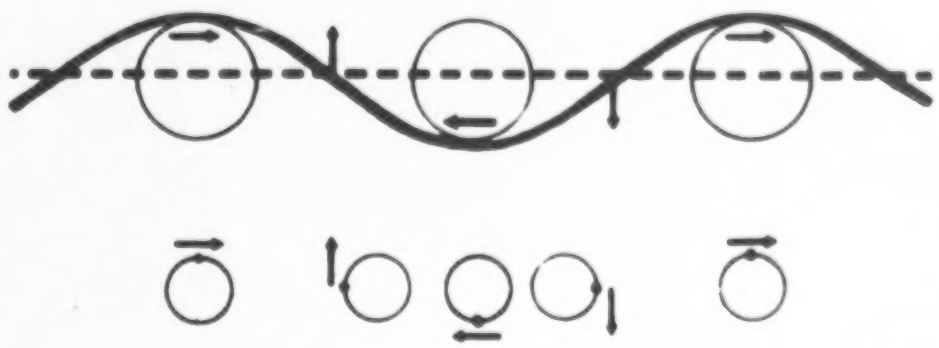
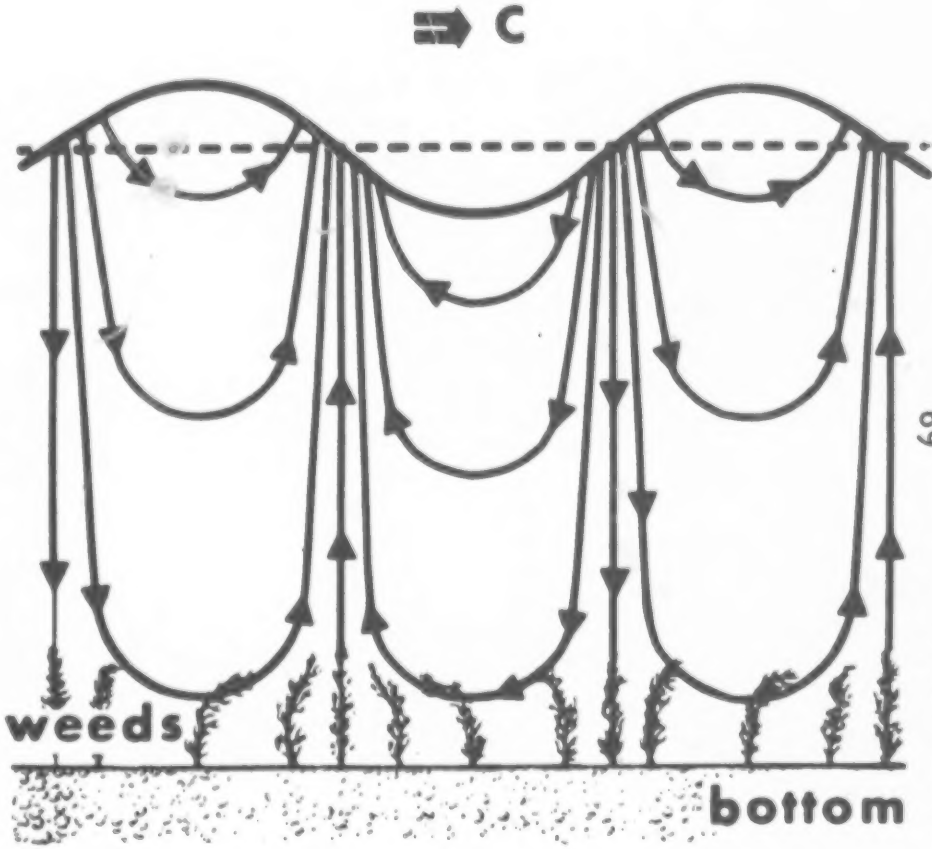
WIND WAVES ON THE OCEAN SURFACE



Paths of particles (.) during one period, T. Trajectories

MOTION OF WATER PARTICLES



A snapshot - instantaneous motion of water particles. Streamlines

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TITLE LISTING OF ALL VISUALS DEVELOPED

The next several pages constitute a complete listing of all the visuals developed in the project. It will be noted that some courses are numbered consecutively while some are divided into topical units.

The sheer volume of visuals developed precludes an annotation of each visual.

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ENGLISH 8

VISUAL NUMBER	TITLE
I, 1	Language Is Like a Code
I, 2	Each Language Is a Different Code
I, 3	We Have a Language Machine
I, 4	In Our Heads
I, 5	Linguistics Uses the Methods of Science
I, 6	Language Is a System of Signals
I, 7	Language Is Based on Sound
I, 8	Language Includes Vocabulary
I, 9	Grammar Is the Organization of Language
I,10	Where Does Grammar Come From?
I,11	Squigs Traze
I,12	Subject/Predicate
I,13	Find the Subject and Predicate
I,14	Subject/Predicate
I,15	Nouns May be Used in Subject Position
I,16	Nouns Tell Number
I,17	Determiners Signal Nouns
I,18	Adjectives
I,19	Comparison of Adjectives I
I,20	Comparison of Adjectives II
I,21	Pronouns Are a Special Group
I,22	Pronouns
I,23	Verbs Are Used in Predicate
I,24	Verbs Have Different Forms
I,25	Verb Form May Tell Time
I,26	Adverbs Answer Certain Questions
I,27	Place-Adverbs Tell Where
I,28	Time-Adverbs Tell When
I,29	Manner-Adverbs Tell How
I,30	Frequency-Adverbs Tell How Often

English 8 (Continued)

VISUAL NUMBER	TITLE
I, 31	Slots in the Sentence
I, 32	What Signals Sentence Structure?
I, 33	Pattern A
I, 34	Pattern B
I, 35	What's Wrong? Why?
I, 36	Some Verbs Fit Both Patterns
I, 37	What's the Difference? (Pattern C)
I, 38	What Patterns Are These? (Pattern D)
I, 39	Other Linking Verbs
I, 40	How Are These Sentences Alike?
I, 41	Compare the Verbs
I, 42	The Be Patterns
I, 43	How Many Be Patterns Can You Find?
I, 44	What Follows Be and V_i
I, 45	How Are These Sentences Alike?
I, 46	Sentence Pattern Summary
II,1	Martian Towns
II,2	How Would You Pronounce These?
II,3	What Sounds Do You Hear?
II,4	What Makes a Vowel Sound Long?
II,5	Hear, See, Spell
III,1	Meaning by Sound
III,2	Listen for Meaning
III,3	Listen to the Accents (Stresses)
III,4	The Third Accent (Stress)
III,5	Phrase Sense by Accent (Stress)
III,6	Phrase Sense by Accent (Stress)
III,7	Sentence Sense by Accent (Stress)
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III,9	Does Your Sentence Look Like This?

English 8 (Continued)

VISUAL NUMBER	TITLE
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III,11	Observe the Pitch Pattern of a Statement
III,12	The Punctuation of Speech
III,13	The End of a Sentence: Juncture
III,14	Meaning by Sound (Intonation)

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ENGLISH 11

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I,3	More Garish Sentences
I,4	Order of Adjectives I & II
I,5	Order of Adjectives III
I,6	Order of Adjectives IV
I,7	Relative Order of Adjective Slots
I,8	Verb Phrase Structure I
I,9	Verb Phrase Structure II
I,10	Verb Phrase Structure III
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I,12	Verb Phrase Structure V
I,13	Tense in the Verb Phrase
I,14	Verb Phrase: Tense Formula
I,15	Lower Garish Grammar
I,16	Question Transformation I
I,17	Input-Output Question
I,18	Question Transformation II
I,19	Negative Transformation I
I,20	Negative Transformation II
I,21	Input-Output Negative
I,22	Emphatic Transformation I
I,23	Emphatic Transformation II
I,24	Input-Output Emphatic
I,25	Passive Transformation
I,26	Passive Transformation
I,27	Input-Output Passive
I,28	What Happens Here?
I,29	There Transformation
I,30	Input-Output There
I,31	Practice There
I,32	Transformation Upper Garish I
I,33	Transformation Upper Garish II
I,34	WH-Transformation I
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I,38	Input-Output Compound, Ellipsis
I,39	Which Elements Are Parallel?
I,40	Why Are These Not Grammatical?

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I, 43	Subordinators
I, 44	Output to Input
I, 45	Relative Transformation I
I, 46	Input-Output Relative, Embedded Subject
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I, 49	Practice (Object)
II, 1	What's the Missing Letter?
II, 2	Spelling the Unstressed Vowel
II, 3	How Are These Words Alike?
II, 4	What Happens to the Sound?
II, 5	Practice
II, 6	More Practice
II, 7	Just for Fun!
III, 1	Acceptable or Non-Acceptable?
III, 2	Levels of Usage
III, 3	Each Level of Usage Is a Dialect
III, 4	The Dialect for the Speaker and the Occasion
III, 5	Dialects: Word Choice and Geography
III, 6	Dialects: Word Choice and Geography
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III, 8	Dialects: Pronunciation and Geography
III, 9	Major Dialect Areas of the United States
III, 10	Your Dialect: Influences
IV, 1	And They All Mean "Three"
IV, 2	Languages in Europe c. 3000 B. C., Map
IV, 3	Languages in Europe c. 500 B. C., Map
IV, 4	Languages in Europe 2000 A. D., Map

VISUAL NUMBER	TITLE
IV, 5	Indo-European, Time Line
IV, 6	Paths to English
IV, 7	Old English
IV, 8	Old English
IV, 9	Borrowed American English
	Currency

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3	Properties of Numeration Systems
4	Expanded Notation
5	Exponential Notation
6	Numeration Bases
7	Base 5 Numeration to Base 10
8	Whole Numbers
9	Whole Numbers
10	Properties of Whole Numbers
11	The Number Line
12	Using the Number Line
13	Betweenness
14	Using the Number Line
15	Half-Lines
16	Half-Planes
17	Segments and Rays
18	Diagonals of Polygons
19	Curves
20	Intersections and Union of Sets
21	Factor Chart
22	Sieve of Eratosthenes
23	Prime Factorizations
24	Greatest Common Factors
25	Hints for Factorization
26	Least Common Multiple
27	Venn Diagrams
28	Venn Diagrams
29	Clock Arithmetic
30	How to Make a Mathematical System
31	An Additive Mathematical System
32	A Multiplicative Mathematical System
33	A Larger Mathematical System
34	Another Mathematical System
35	A Number of Arithmetic

Mathematics 7 (Continued)

VISUAL NUMBER	TITLE
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37	Division of Numbers of Arithmetic
38	Division of Numbers of Arithmetic
39	Addition of Numbers of Arithmetic
40	Order for the Numbers of Arithmetic
41	Repeating Decimal Numerals
42	Geometric Figures
43	Measures of Segments
44	Measures of Segments
45	Measures of Segments
46	Triangles
47	Rectangles
48	Classification of Triangles
49	Classification of Triangles
50	Regular Polygons
51	Measurement
52	Unit Symbols in Computation
53	Measurement and Changing Units
54	Systems of Measure
55	Changing Units of Measure

ALGEBRA

VISUAL NUMBER	TITLE
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3	Ordering of Numbers
4	Concept of Set
5	Binary Operations with Sets
6	Name for Numbers
7	Grouping Symbols
8	Facts about Sentences
9	Open Sentences
10	Replacement Set of a Variable
11	Solution Set of an Open Sentence
12	Equality
13	Axioms of Equality
14	Example of a Relation Which Is Not an Equality
15	Example of an Equality
16	Closure Property
17	Commutative Property
18	Associative Property
19	Identity Elements
20	Distributive Property
21	Addition Property of Equality
22	Multiplication Property of Equality
23	Geometric Introduction of Negative Numbers
24	Terminology of Real Numbers - Signed Numbers
25	Magnitude and Direction
26	Order on the Number Line
27	Addition of Real Numbers
28	Properties of Addition
29	Exploring a Property of Addition
30	Opposites
31	Absolute Value
32	Subtraction
33	A Subtraction Theorem
34	Desirable Properties of Multiplication
35	Multiplication Property of Opposites

Algebra (Continued)

VISUAL NUMBER	TITLE
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37	Reciprocals
38	Division of Real Numbers
39	Further Properties of Order
40	Order - Addition, Order - Subtraction
41	Order - Multiplication Properties
42	Definition of a Monomial
43	Definition of a Polynomial
44	Sum of Two Polynomials
45	Product of Two Polynomials
46	Factoring
47	Difference of Two Squares
48	Special Trinomials
49	Factoring Quadratic Trinomials
50	Characteristics of the Factors of a Trinomial
51	Factoring a Trinomial
52	Factoring a Trinomial
53	Factors of Zero
54	Solution of a Quadratic Equation
55	Field Properties of R
56	Definitions and Vocabulary
57	Some Other Properties of R
58	The Fraction Concept
59	Theorem for Reducing Fractions
60	Examples of Reducing Fractions
61	Theorem for Multiplying Fractions
62	Examples of Multiplying Fractions
63	Theorem for Dividing Fractions
64	Theorem for Adding Fractions
65	Solution Set of an Open Sentence in Two Variables
66	Vocabulary of Coordinate Systems
67	Locating Points
68	The Graph of a Linear Equation with Two Variables
69	Slope Concept
70	Lines with Different Slopes

Algebra (Continued)

VISUAL NUMBER	TITLE
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72	Slope Intercept Form
73	Geometry of Slope-Intercept Form
74	Graphs of Open Sentences with Two Variables
75	Writing Sentences for Graphs
76	Graphical Solutions of Linear Equations with Two Variables
77	Graphical Solution of Inequalities with Two Variables
78	Equivalent Systems
79	Equivalent Systems Theorem
80	Applications of Equivalent Systems
81	Definition of Rational Numbers
82	Irrational Numbers
83	Classification of Real Numbers
84	Definition of Power
85	Law of Exponents
86	Laws of Positive Integral Exponents (Continued)
87	Definition of Exponent Zero
88	Definition of Square Roots
89	Principal Roots of Non-Negative Numbers
90	Fundamental Properties of Radicals
91	Concepts of Relationships
92	Definition of Relation
93	Domain and Range of a Relation
94	Functions
95	Direct Variation
96	Inverse Variation
97	Properties of Real Numbers
98	Definition and Examples of Quadratic Equation
99	Solution of a Quadratic Equation by Factoring
100	Solution of a Quadratic Equation by Completing the Square
101	Solution of a Quadratic Inequality
102	Graph of $Y = X^2 - 2X - 3$ and the Graphical Solution of $X^2 - 2X - 3 = 0$

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GEOMETRY

VISUAL NUMBER	TITLE
I, 1	Sets of Points
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I, 3	Angle Constructions
I, 4	Construction of Perpendicular Lines
I, 5	Construction of Perpendicular Lines
I, 6	Angles
I, 7	Angles
I, 8	Triangles
I, 9	Triangle Construction, Given Three Sides
I, 10	Dihedral Angle
II, 1	Logic
II, 2	Equivalence Relation
II, 3	Properties of Equality
II, 4	Properties of Equality
II, 5	Formal Proofs
II, 6	Forms of Proofs
III, 1	Special Line Segments and Angles
III, 2	Congruences of Triangles
III, 3	Proving Triangles Congruent
III, 4	Congruent Right Triangles
III, 5	Overlapping Triangles
III, 6	Combined Congruences
III, 7	Isosceles Triangle
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III, 9	Polyhedral Angles
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IV, 2	Alternate Interior Angles
IV, 3	Angles with Parallel Sides
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V, 2	Triangle Construction
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V, 4	Triangle Construction of an Ambiguous Case
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Geometry (Continued)

VISUAL NUMBER	TITLE
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VI, 3	Sum of Angles in a Polygon
VI, 4	Sum of Exterior Angles of a Polygon
VI, 5	Quadrilaterals
VI, 6	Plane Quadrilaterals
VI, 7	Opposite Sides and Angles of a Parallelogram
VI, 8	Diagonals of a Parallelogram
VI, 9	Sufficient Conditions for a Parallelogram
VI,10	Parallel Lines and Transversals
VI,11	Line Bisecting Two Sides of a Triangle
VI,12	Median of a Trapezoid
VI,13	Division of a Line Segment
VI,14	Polyhedron
VI,15	Prism
VI,16	Types of Prisms
VI,17	Parallelepipeds
VI,18	Sections of a Prism
VI,19	Pyramids
VII,1	Ratio and Proportions
VII,2	Third, Fourth, and Mean Proportionals
VII, 3	Proportion Theorems
VII, 4	Proportion Theorems
VII, 5	Proportion Theorems
VII, 6	Proportion Theorems
VII, 7	Series of Equal Ratios
VII, 8	Line Parallel to One Side of a Triangle
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VII,10	Dividing a Line Segment into Segments Proportional to Given Segments
VII,11	Proportional Line Segments in Space

Geometry (Continued)

VISUAL NUMBER	TITLE
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VIII, 2	Mutually Equiangular Polygons
VIII, 3	Similar Triangles
VIII, 4	Similar Triangle Construction
VIII, 5	Similarities in Right Triangle
VIII, 6	Plane Parallel to the Base of a Pyramid
VIII, 7	Pythagorean Theorem
VIII, 8	Pythagorean Theorem
VIII, 9	Euclid's Proof
VIII,10	Length of a Diagonal of a Rectangular Solid
VIII,11	Intersection of Plane and Sphere
VIII,12	Special Right Triangles
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IX, 2	Lines and Circles
IX, 3	Diameter Perpendicular to a Chord
IX, 4	Chords in Equal Circles
IX, 5	Line of Centers
IX, 6	Cylinders and Cones
IX, 7	Right Circular Cone
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X, 2	Mean Proportional
X, 3	Proportions Involving Chords, Secants, and Tangent
X, 4	Spheres
X, 5	Measurement of Angle Exercise
XI, 1	Area of a Parallelogram
XI, 2	The Area of a Trapezoid
XI, 3	The Trapezoidal Rule
XI, 4	Area of a Triangle -- Hero's Formula
XI, 5	Area of Similar Triangles
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XII, 2	Midpoint in One Dimension
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Geometry (Continued)

VISUAL NUMBER	TITLE
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XII, 6	Slopes of Perpendicular Lines
XII, 7	Equation of a Circle
XII, 8	Angle Inscribed in a Semi-Circle
XII, 9	Area of a Triangle
XIII, 1	Simple Loci
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XIII, 6	The Medians of a Triangle
XIII, 7	The Altitudes of a Triangle
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XIII, 9	Exercises on Loci: Planes and Points
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XIII,11	Exercises on Loci
XIII,12	Equation of a Locus
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XIII,15	Construction of a Triangle, Given Three Medians
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Geometry (Continued)

VISUAL NUMBER	TITLE
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XVII, 2	Formal Proof Form
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EARTH SCIENCE

VISUAL NUMBER	TITLE
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I, 3	Relative Sizes of the Sun and Planets
I, 4	Seasons of the Year
I, 5	Eclipse of the Moon and Sun
I, 6	Cause of Tides
I, 7	Time of Day in Northern Hemisphere
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II, 10	Position of Bedding (Strike and Dip)
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II, 13	Deformation of the Earth's Crust
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II, 15	Deformation of the Earth's Crust
II, 16	Density Difference Causes Salt Doming
II, 17	Density Difference Causes Salt Doming
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II, 19	The Water Table
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II, 21	Radioactive Decay: The Half-Life Concept
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II, 24	Development of Land Form by Rivers
II, 25	Development of Land Form by Rivers
II, 26	Mineral Structure: The Silicates

Earth Science (Continued)

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III,1	Oceans of Planet Earth
III,2	Oceans and the Water Cycle
III,3	Heat Balance of the World Ocean
III,4	Cycle of Life in the Oceans
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III,6	"Inner Space"
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IV,4	Vertical Distribution of Average Temperature--Northern Hemisphere--Summer and Winter
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IV,8	Sea and Land Breezes -- Mountain and Valley Breezes
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I, 6	Aspects of the Preterit (Past) Tense (Part 1)
I, 7	Aspects of the Preterit (Past) Tense (Part 2)
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I, 10	Uses of Ser and Estar (Location)
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I, 18	Demonstratives: Adjectives and Pronouns, Masculine Forms, (Singular)
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Spanish I (Continued)

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II, 6	First Concept of the Subjunctive: Implication of a Command (Part 2)
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II, 8	Second Concept of the Subjunctive: Emotion (Part 2)
II, 9	Third Concept of the Subjunctive: Unreality, (Part 1, A--Doubt)
II, 10	Third Concept of the Subjunctive: Unreality (Part 1, B--Indefiniteness)
II, 11	Third Concept of the Subjunctive: Unreality (Part 1, C--Non-existence)
II, 12	Third Concept of the Subjunctive: Unreality (Part 2, A--Conjunctions such as Sin Que)
II, 13	Third Concept of the Subjunctive: Unreality (Part 2, B--Conjunction Cuando)
II, 14	Third Concept of the Subjunctive: Unreality (Part 2, C--Conjunction Aunque)
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II, 16	Reflexive Pronouns (Part 2--Reciprocal Construction)
II, 17	Reflexive Pronouns (Part 3, A--Passive Voice)
II, 18	Reflexive Pronouns (Part 3, B-Impersonal Passive Voice)
II, 19	Reflexive Pronouns (Part 4--Change of Meaning in Certain Verbs)
II, 20	Reflexive Pronouns (Part 5--Unplanned Occurrences)
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Spanish II (Continued)

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II, 23	Uses of Por--Para (Motivation)
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II, 25	Uses of Por--Para (Passage Through Space)
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II, 29	Uses of Por--Para ("In Favor" & "About to")

WORLD GEOGRAPHY

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I, 2	Areas of Population Concentration
I, 3	North Africa, Southwest Asia, and Southern Europe
I, 4	African Climographs
I, 5	Dependability of Precipitation and Temperature Regions
I, 6	Natural Limitations on Agriculture
I, 7	Africa Compared to the United States
I, 8	Major Mineral Deposits and Railroads
I, 9	Elevation
I, 10	Population Density and Agricultural Land Use
I, 11	Rainfall (Rivers and Lakes)
I, 12	Political Units 1965
II, 1	Natural Vegetation in Middle America
II, 2	The Americas
II, 3	Middle America
II, 4	Natural Vegetation and Land Forms of South America
II, 5	Rainfall and Land Forms of Central America
II, 6	Gatun Locks
II, 7	Canal Zone
II, 8	Rainfall and Land Forms of Mexico
II, 9	Land Use and Population of Central America
II, 10	Selected Regional Names of South America
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VISUAL NUMBER	TITLE
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II, 17	Correlation of Illiteracy with Gross National Product and Life Expectancy
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III, 3	Precipitation and Natural Vegetation
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III, 7	Winter and Summer Temperatures of Australia
III, 8	Distribution of People and Land Use Areas
IV, 1	Man Views His World
IV, 2	Man Uses His World
IV, 3	Outline Map
IV, 4	Ways of Looking at the World
IV, 5	Elevation and Relief
IV, 6	Railroads of Europe, Asia, Africa, and Australia
IV, 7	Railroads of North and South America
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IV, 9	The Earth
IV, 10	The Earth's Grid
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IV, 15	Natural Vegetation of the World
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IV, 17	World Land Forms
IV, 18	Major Climates of the World
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IV, 20	Concept of Longitude and Latitude

VISUAL NUMBER	TITLE
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IV, 23	Azimuthal Projection
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V, 3	Oil Production in Southwest Asia
V, 4	Croplands of Asia
V, 5	Political Outlines and Major Cities of Asia
V, 6	Population Density
V, 7	Rainfall of Southwest Asia
V, 8	Physical Map of Asia
V, 9	Southwest Asia
V, 10	Pakistan: A Nation Divided
V, 11	Asian Climographs
V, 12	Land Use in Southwest Asia
V, 13	Elevation Southwest Asia
V, 14	Irrigation in Southwest Asia
V, 15	Political Divisions and Major Cities of Southeast Asia
V, 16	Population: Southwest Asia
V, 17	Annual Rainfall
V, 18	Seasonal Variation in Asia's Rainfall
V, 19	India: Population, Rainfall, Elevation
VI, 1	Japan: Foreign Trade
VI, 2	Comparison of United States and China
VI, 3	China and Border Lands
VI, 4	Japan: An Island Nation

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VII, 2	Agricultural Projects of Western Europe
VII, 3	Europe: Temperature and Rainfall, January and July
VII, 4	Land Use: Industrial Regions
VII, 5	Urban Areas: Europe and India
VII, 6	Europe: Regional Names
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VII, 8	Three European Climographs
VII, 9	Europe in Perspective
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VII, 11	European Population Density Per Square Mile
VIII, 1	United States Climographs: Duluth, Nashville, San Francisco
VIII, 2	Mexico: States and Territories
VIII, 3	Mexico: Economic Regions and Population
VIII, 4	Alaska: Vegetation Areas, Coal Deposits
VIII, 5	Alaska: Population, Major Cities
VIII, 6	Alaska: Rail and Highway Routes
VIII, 7	Alaska: Average Temperatures
VIII, 8	Alaska: Growing Season and Permafrost Area
VIII, 9	Alaska: Average Rainy Season and Rainfall
IX, 1	Mineral Resources of the U. S. S. R.
IX, 2	Population and Transportation Patterns
IX, 3	Production: Wheat, Rye, Oats,..
IX, 4	Comparison: U. S. S. R. and United States
IX, 5	Natural Limitations to Agriculture
IX, 6	U. S. S. R. - Territorial Extent

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VISUAL NUMBER	TITLE
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IX, 8	The Soviet Union
IX, 9	South American Climographs
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CHEMISTRY

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3	A Charge Cloud Model
4	The Formation of H_2
5	Charge-Cloud Model for Neon
6	Charge-Cloud Model for an Oxygen Atom
7	Charge-Cloud Model for Water
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9	Charge-Cloud Model for Carbon
10	Charge-Cloud Model for Carbon #2
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12	Charge-Cloud Model for Carbon #4
13	Extensions of the Charge-Cloud Model
14	Chemical Symbols
15	The Evolution of a Chemical Equation
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17	Gas Laws-Temperature Effect (Charles Law)
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19	The Mole
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21	Factor-Label Method of Problem Solving (Conversion Factors)
22	Problem Solving by Factor-Label Method
23	Problem Solving by Factor-Label Method
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28	Table of Electro Negativities (Pauling Scale)
29	Bond Polarity
30	Polarity Differences
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32	Relationship Between Bonding and Dissolving
33	A Model for Dissolving of Van Der Wool's Crystals in Non-Polar Liquids
34	Electron Configuration of Atoms
35	Shapes of Atomic Orbitals
36	p-Orbital Bonding
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38	Excitation of Valence Electrons
39	Electrolysis of $CuCl_2$, Water Solution
40	Ionization Theory
41	Ionization Theory (Continued)
42	Oxidation Numbers, General and Specific Rules
43	Balancing Oxidation-Reduction Equations
44	Balancing Oxidation-Reduction Equations
45	Gram-Equivalents of Oxidizing and Reducing Agents
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47	A Problem to be Explained by Acid-Base Theory
48	Acid-Base Reactions As a Competition for Protons
49	Acid Base Concepts
50	Collisions of Molecules
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52	Energy of Interactions
53	Rate of Reaction
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58	Structural Isomerization
59	Geometrical Isomerization, Cis-Trans Isomers
60	Geometrical Isomerization, Optical Isomers
61	Functional Groups
62	Effect of Catalysts on Reactions
63	Effect of Catalysts on Reactions
64	Law of Constant Heat Summation
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66	Exothermic and Endothermic Reactions
67	Exothermic and Endothermic Reactions
68	Energy Requirements for Interaction
69	Energy Changes in the Dissolving Process